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10/572,680

03/20/2006

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EXAMINER

HO, HOANG QUAN TRAN

ART UNIT

PAPER NUMBER

2818

| SHORTENED STATUTORY PERIOD OF RESPONSE | MAIL DATE | DELIVERY MODE |
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3 MONTHS

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/572,680

Applicant(s)

TOMOZAWA ET AL.

Examiner

Hoang-Quan Ho

Art Unit

2818

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 20 March 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 March 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 3/20/06.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1, 3 – 16 are rejected under 35 U.S.C. 102(b) as being anticipated by Chen et al. (Microstructural investigation of oxidized Ni/Au ohmic contact to p-type GaN), hereinafter as Chen.

Regarding claim 1, fig. 2b of Chen teaches an electrode for use in a gallium nitride-based compound semiconductor light-emitting device (pg. 3826, Introduction section, 1st par.) comprising a light-permeable first layer (fig. 2b, ref. char. a) which is in contact with a surface of a p-contact layer (fig. 2b, ref. char. p-GaN) in a gallium nitride-based compound semiconductor light-emitting device (pg. 3826, Introduction section, 1st par.) and which is capable of providing ohmic contact, and a second layer (fig. 2b, ref. char. c) which is in contact with a part of a surface of said p-contact layer, wherein said

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first layer comprises a metal, or an alloy of two or more metals, selected from a first group consisting of Au, Pt, Pd, Ni, Co, and Rh (pg. 3827 – 3828, Results and Discussion section, 2nd par.), and said second layer comprises an oxide of at least one metal selected from a second group consisting of Ni, Ti, Sn, Cr, Co, Zn, Cu, Mg, and In (pg. 3827 – 3828, Results and Discussion section, 2nd par.).

Regarding claim 3, Chen teaches an electrode according to claim 1, Chen further teaches wherein a portion of the surface of said p-contact layer, which portion is not in contact with said second layer, includes an oxygen- lacking portion (fig. 7d, ref. char. Au-rich and/or ref. char. void; pg. 3830, 2nd par.).

Regarding claim 4, Chen teaches an electrode according to claim 1, Chen further teaches which further comprises a third layer (fig. 2b, ref. char. b) on a surface of said first layer opposite the side in contact with said p-contact layer, said third layer comprising an oxide of at least one metal selected from said second group (pg. 3827 – 3828, Results and Discussion section, 2nd par.).

Regarding claim 5, Chen teaches an electrode according to claim 1, Chen further teaches wherein said first layer comprises an alloy of Au with Ni and/or Co (pg. 3827 – 3828, Results and Discussion section, 2nd par.).

Regarding claim 6, Chen teaches an electrode according to claim 1, Chen further teaches wherein said second layer comprises an oxide of Ni and/or Co (pg. 3827 – 3828, Results and Discussion section, 2nd par.).

Regarding claim 7, Chen teaches an electrode according to claim 4, Chen further teaches wherein said third layer comprises an oxide of Ni and/or Co (pg. 3827 – 3828, Results and Discussion section, 2nd par.).

Regarding claim 8, Chen teaches an electrode according to claim 1, Chen further teaches wherein said second layer accounts for 0.01 to 90% of the surface of said p-contact layer (as seen in figs. 2a – 2b and 7d).

Regarding claim 9, Chen teaches an electrode according to claim 3, Chen further teaches wherein said oxygen-lacking portion accounts for 10% or more of the surface of said p-contact layer (as seen in fig. 7d; pg. 3830, 2nd par.).

Regarding claim 10, Chen teaches an electrode according to claim 1, Chen further teaches wherein said second layer has a thickness of 0.1 to 100 nm (pg. 3827, col. 1, Experiment section, 1st par.).

Regarding claim 11, Chen teaches an electrode according to claim 5, Chen further teaches wherein said alloy of said first layer has an Ni and/or Co content of 0.01 to 70 atom % (pg. 3829, 2nd par.).

Regarding claim 12, Chen teaches an electrode according to claim 1, Chen further teaches wherein said first layer has a thickness of 0.1 to 100 nm (pg. 3827, col. 1, Experiment section, 1st par.).

Regarding claim 13, Chen teaches an electrode according to claim 4, Chen further teaches wherein said third layer has a thickness of 1 nm or more (obvious in figs. 2b and 7d).

Regarding claim 14, Chen teaches an electrode according to claim 1, Chen further teaches wherein said first layer has one or more pores in a portion thereof (as seen in fig. 7d).

Regarding claim 15, Chen teaches an electrode according to claim 1, Chen further teaches wherein said first layer has a thick portion and a thin portion (as seen in fig. 7d).

Regarding claim 16, Chen teaches a gallium nitride-based compound semiconductor light-emitting device (pg. 3826, Introduction section, 1st par.) comprising

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an n-contact layer, a light-emitting layer and a p-contact layer formed on a substrate, which are composed of a gallium nitride-based compound semiconductor and which are sequentially stacked in the above order, and a negative electrode and a positive electrode which are formed on a surface of said n-contact layer and a surface of said p-contact layer, respectively, wherein said positive electrode is formed of an electrode according to claim 1 (see claim 1 rejection based on Chen).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen as applied to claim 1 above, and further in view of Sheu et al. (The effect of thermal annealing on the Ni/Au contact of p-type GaN), hereinafter as Sheu.

Regarding claim 2, Chen teaches an electrode according to claim 1, but does not explicitly teach wherein said first layer further comprises Ga. Sheu teaches that it is known in the art to provide first layer comprising Ga (pg. 3175, col. 2, last par. before Conclusion section). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the device of Chen with the Ga-Ni and/or Ga-Au compound(s) of Sheu, in order to influence electrical properties of contacts. Also, Sheu teaches from the citation that Ga would form with Ni and/or Au due to chemical products between metal and semiconductor layers. So in essence, Chen's teaching may obviously form Ga-Ni and/or Ga-Au compound(s) even though it is not explicitly taught.

Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over Chen and further in view of Chen et al. (U.S. Patent App. Pub. No. 2003/0010994 A1), hereinafter as ChenJ.

Regarding claim 16, assuming arguendo, Chen does not explicitly teach a gallium nitride-based compound semiconductor light-emitting device comprising an n-contact layer, a light-emitting layer and a p-contact layer formed on a substrate, which

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are composed of a gallium nitride-based compound semiconductor and which are sequentially stacked in the above order, and a negative electrode and a positive electrode which are formed on a surface of said n-contact layer and a surface of said p-contact layer, respectively, but teaches wherein said positive electrode is formed of an electrode according to claim 1 (see claim 1 rejection based on Chen).

Fig. 1 of ChenJ teaches that it is known in the art to provide a gallium nitride-based compound semiconductor light-emitting device comprising an n-contact layer (ref. no. 104), a light-emitting layer (ref. no. 106) and a p-contact layer (ref. no. 107) formed on a substrate (ref. no. 101), which are composed of a gallium nitride-based compound semiconductor (abstract) and which are sequentially stacked in the above order, and a negative electrode (ref. no. 105) and a positive electrode (ref. nos. 112 and/or 113; see claim 1 rejection based on Chen) which are formed on a surface of said n-contact layer and a surface of said p-contact layer, respectively (as seen in fig. 1). It would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the device of Chen with the GaN based compound semiconductor LED of ChenJ, in order to provide a LED structure.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Hoang-Quan Ho whose telephone number is (571) 272-8711. The examiner can normally be reached on Monday - Friday, 9 AM - 5 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith can be reached on (571) 272-1907. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

HQH
February 2, 2007

Andy Huyen
Andy Huyen
Primary Examiner